ATTACHMENT 1

Proposed Technical Specification Changes

CONTAINMENT SYSTEMS

3/4.6.5 ICE CONDENSER

ICE BED

LIMITING CONDITION FOR OPERATION

3.6.5.1 The ice bed shall be OPERABLE with:

a. The stored ice having a boron concentration of at least 1800 ppm boron as sodium tetraborate and a pH of 9.0 to 9.5,

b. Flow channels through the ice condenser,

c. A maximum ice bed temperature of less than or equal to 27°F,

d. A total ice weight of at least ~~2,368,652~~ 2,475,252 pounds at a 95% level of confidence, and

e. 1944 ice baskets.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTION:

With the ice bed inoperable, restore the ice bed to OPERABLE status within 48 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

SURVEILLANCE REQUIREMENTS

4.6.5.1 The ice condenser shall be determined OPERABLE:

a. At least once per 12 hours by using the Ice Bed Temperature Monitoring System to verify that the maximum ice bed temperature is less than or equal to 27°F,

b. At least once per 9 months by:

1) Chemical analyses which verify that at least nine representative samples of stored ice have a boron concentration of at least 1800 ppm as sodium tetraborate and a pH of 9.0 to 9.5 at 25°C, and

2) (INSERT INDICATED PARAGRAPH ON PAGE 3/4 6-42)

C. AT LEAST ONCE PER 18 MONTHS BY:

~~2)~~ Weighing a representative sample of at least 144 ice baskets and verifying that each basket contains at least ~~1218~~ 1273 lbs of ice. The representative sample shall include six baskets from each of the 24 ice condenser bays and shall be constituted of

INSERT BELOW 4.6.5.1.b.1) ON PAGE 3/4 6-41

one basket each from Radial Rows 1, 2, 4, 6, 8, and 9 (or from the same row of an adjacent bay if a basket from a designated row cannot be obtained for weighing) within each bay. If any basket is found to contain less than ~~1218~~ 1273 pounds of ice, a representative sample of 20 additional baskets from the same bay shall be weighed. The minimum average weight of ice from the 20 additional baskets and the discrepant basket shall not be less than ~~1218~~ 1273 pounds/basket at a 95% level of confidence.

The ice condenser shall also be subdivided into 3 groups of baskets, as follows: Group 1 - Bays 1 through 8, Group 2 - Bays 9 through 16, and Group 3 - Bays 17 through 24. The minimum average ice weight of the sample baskets from Radial Rows 1, 2, 4, 6, 8, and 9 in each group shall not be less than ~~1218~~ 1273 pounds/basket at a 95% level of confidence.

The minimum total ice condenser ice weight at a 95% level of confidence shall be calculated using all ice basket weights determined during this weighing program and shall not be less than ~~2,368,652~~ 2,475,252 pounds~~; and~~.

2 ~~3~~) Verifying, by a visual inspection of at least two flow passages per ice condenser bay, that the accumulation of frost or ice on flow passages between ice baskets, past lattice frames, through the top deck floor grating, or past the lower inlet plenum support structures and turning vanes is restricted to a thickness of less than or equal to 0.38 inch. If one flow passage per bay is found to have an accumulation of frost or ice with a thickness of greater than or equal to 0.38 inch, a representative sample of 20 additional flow passages from the same bay shall be visually inspected. If these additional flow passages are found acceptable, the surveillance program may proceed considering the single deficiency as unique and acceptable. More than one restricted flow passage per bay is evidence of abnormal degradation of the ice condenser.

d. ~~f~~. At least once per 40 months by lifting and visually inspecting the accessible portions of at least two ice baskets from each one-third of the ice condenser and verifying that the ice baskets are free of detrimental structural wear, cracks, corrosion or other damage. The ice baskets shall be raised at least 12 feet for this inspection.

3/4.6.5 ICE CONDENSER

The requirements associated with each of the components of the ice condenser ensure that the overall system will be available to provide sufficient pressure suppression capability to limit the containment peak pressure transient to less than 14.7 psig during LOCA conditions.

3/4.6.5.1 ICE BED

The OPERABILITY of the ice bed ensures that the required ice inventory will: (1) be distributed evenly through the containment bays, (2) contain sufficient boron to preclude dilution of the containment sump following the LOCA, and (3) contain sufficient heat removal capability to condense the Reactor Coolant System volume released during a LOCA. These conditions are consistent with the assumptions used in the safety analyses.

The minimum weight figure of ~~1218~~ 1273 pounds of ice per basket contains a ~~10%~~ 15% conservative allowance for ice loss through sublimation. ~~which is a factor of 10 higher than assumed for the ice condenser design.~~ The minimum total weight of ~~2,368,652~~ 2,475,252 pounds of ice also contains an additional ~~1%~~ 1.1% conservative allowance to account for systematic error in the weighing instruments. In the event that observed sublimation rates are equal to or lower than design predictions after 3 years of operation, the minimum ice baskets weight may be adjusted downward. ~~In addition, the number of ice baskets required to be weighed each 9 months may be reduced after 3 years of operation if such a reduction is supported by observed sublimation data.~~

3/4.6.5.2 ICE BED TEMPERATURE MONITORING SYSTEM

The OPERABILITY of the Ice Bed Temperature Monitoring System ensures that the capability is available for monitoring the ice temperature. In the event the system is inoperable, the ACTION requirements provide assurance that the ice bed heat removal capacity will be retained within the specified time limits.

3/4.6.5.3 ICE CONDENSER DOORS

The OPERABILITY of the ice condenser doors and the requirement that they be maintained closed ensures that the Reactor Coolant System fluid released during a LOCA will be diverted through the ice condenser bays for heat removal and that excessive sublimation of the ice bed will not occur because of warm air intrusion.

If an Ice Condenser Door is not capable of opening automatically then system function is seriously degraded and immediate action must be taken to restore the opening capability of the door. Not capable of opening automatically is defined as those conditions in which a door is physically blocked from opening by installation of a blocking device or by obstruction from temporarily or permanently installed equipment. Impairment by ice, frost or debris is considered to render the doors inoperable but capable of opening automatically since these types of conditions will result in a slightly greater torque necessary to open the doors or a slight delay in door opening.

ATTACHMENT 2

Justification and Safety Analysis

Introduction

The requested changes to Technical Specification (TS) 3/4.6.5.1 change the frequency of ice basket weighing from at least once per 9 months to at least once per 18 months. To ensure the minimum ice weight does not fall below that required by the safety analysis, the required TS ice bed weight (total ice bed and per ice basket) of the Ice Condenser will be increased. The TS Bases section has been revised to reflect the above changes and to correct an existing error.

Background

As discussed in FSAR Section 6.2.1.1.1, the Ice Condenser is designed to limit the Containment pressure below the design pressure for all reactor coolant pipe break sizes up to and including a double-ended severance. The Ice Condenser also serves as a Containment air purification and cleanup system by absorbing molecular iodine from the containment atmosphere following a LOCA as described in FSAR Section 6.5.4. The required boron concentration (at least 1800 ppm) and pH (9.0 - 9.5) of the stored ice is not affected by this TS change request. Therefore, the air purification aspects of the Ice Condenser remain unchanged by this submittal.

The Ice Condenser is subdivided into 24 bays which contain 1944 ice baskets that are 12 inches in diameter and 48 feet long. Each bay consists of 9 columns and 9 rows of ice baskets. The ice baskets function to promote heat transfer from the steam to the ice during and following a LOCA or steam line break in the Containment by ensuring the ice inventory is evenly distributed, contains sufficient heat removal capability, and is maintained in the appropriate geometry. Refer to FSAR Figure 6.7-1 for an isometric drawing of the Ice Condenser. The Ice Condenser is also administratively subdivided into 3 groups of baskets for the purpose of ice weighing. Group 1 consists of bays 1 through 8, Group 2 consists of bays 9 through 16, and Group 3 consists of bays 17 through 24.

Technical Specification 3/4.6.5.1 specifies that the ice bed shall be operable with a total ice weight of at least 2,368,652 pounds at a 95% level of confidence with 1944 ice baskets. This is the minimum amount of ice to be maintained in the Ice Condenser to control the anticipated heat load during a large scale LOCA. These conditions are applicable in Modes 1 through 4. The TS action statement specifies that with the ice bed inoperable, restore the ice bed to operable status within 48 hours or the Unit must be in at least Hot Standby within the next 6 hours and in Cold Shutdown within the following 30 hours.

Per FSAR Section 6.2.1.'.3.1, Loss of Coolant Accident, the "Peak Containment Pressure Transient" analysis assumes 2,132,000 pounds of ice initially in the Ice Condenser. A 10% conservative allowance for ice bed loss through sublimation is added to the above value as well as a 1.1% conservative allowance to account for errors in the weighing instruments (Note that the current TS 3/4.6.5.1 Bases Section incorrectly states that the i. strument error is 1% than the actual value of 1.1%). These conse: vative allowances are intended to ensure that the actual total ice weight remains above the value assumed in the FSAR analysis for the duration of the fuel cycle. Thus, the TS minimum ice bed weight is calculated as 2,132,000 lbs. plus 11.1% (236,652 lbs.) for a total weight of 2,368,652 lbs. This value, when divided by the number of ice baskets (1944) determines the minimum average TS ice weight per basket as 1218 pounds.

TS Surveillance Requirement 4.6.5.1 currently requires that at least once per 9 months a representative sample of at least 144 ice baskets be weighed to verify with a 95% Level of Confidence that the minimum average weight for Bay and Row group ice baskets is 1218 lbs. with a minimum total ice bed weight of 2,368,652 lbs. If any basket is found to contain less than 1218 lbs. of ice, a representative sample of 20 additio..al baskets from the same Bay shall be weighed. The minimum average weight of ice from the 20 additional baskets and the discrepant basket shall not be less than 1218 lbs. per basket at a 95% confidence level. The basis for this requirement recognizes that sublimation will occur during Unit operation resulting in lowered ice weights (some possibly below 1218 lbs.), a.ıd it is not meant to impose this weight limit for all baskets at all times as long as the total ice weight can be shown not to be less than 2,368,652 lbs. at the surveillance period.

As noted above, the TS Limiting Condition for Operation total ice weight (2,368,652 lbs.) is to ensure the actual ice bed weight remains above the value assumed in the FSAR analysis for the duration of the fuel cycle (2,132,000 lbs.). Therefore, the TS surveillance requirements were written to ensure that the actual minimum average ice weight for any statistical sub-group always remains above 1097 lbs. per basket (2,132,000 lbs. divided by 1944 baskets). The 1097 lbs. per basket required by the safety analysis plus a 1.1% weighing uncertainty factor equals 1109 lbs. per basket and is referred to as the design basis weight for each ice basket. As long as the measured minimum average ice weight per basket remains above 1109 lbs. from one refueling outage to the next, an adequate safety margin is maintained.

<u>Technical Justification and Safety Analysis</u>

To provide justification for a TS change to decrease the frequency of the ice basket weighing program from 9 months to 18 months, past operating experience at Catawba was analyzed to evaluate ice basket sublimation rates. The current TS total ice weight and minimum average ice basket ice weights are based upon a 10% per nine month sublimation rate as discussed in the "Background" section of this attachment. Operating experience at Catawba has shown that Ice Condenser sublimation rates are much less than this value.

The average ice basket sublimation rates from previous years are tabulated below for Unit 1 and Unit 2. The average pounds per year sublimation rates are based upon actual weighing data taken during the TS surveillance periods and include data for all 1944 ice baskets. An average "percent per year" sublimation rate was then calculated based upon the average pounds per year sublimation rate applied to the existing TS minimum average ice basket ice weight of 1218 pounds. Actual sublimation rate percentages would be lower than those calculated because the ice baskets are always loaded heavier than the minimum TS requirement. As shown in the tables, the worst case average sublimation rate based upon all Ice Condenser ice baskets on a per year basis is less than 5% per year.

Average Ice Basket Sublimation Rates Based Upon All Ice Baskets

Unit 1			Unit 2		
	Sublimation Rate			Sublimation Rate	
Year	(lbs/yr)	(%/yr)	Year	(lbs/yr)	(%/yr)
1985	59	4.84	-	-	-
1986	47	3.86	-	-	-
1987	38	3.12	1987	59	4.84
1988	29	2.38	1988	39	3.20
1989	39	3.20	1989	39	3.20
1990	29	2.38	1990	33	2.71

In addition to analyzing the total average ice basket sublimation rates, the average sublimation rate and the average ice basket weight were determined from the worst case baskets (Row 9) for all 24 Bays as shown in Enclosure 1. Unit 1 data is tabulated on page 1 of Enclosure 1, and Unit 2 data is tabulated on page 2. Row 9 was chosen because it is the row adjacent to the crane wall (closest to the reactor) and therefore experiences the highest sublimation rates in the Ice Condenser. The average sublimation rate for both the Unit 1 and Unit 2, Row 9 baskets is also less than 5% per year.

To account for increased sublimation between surveillance periods in the proposed TS change, the total required ice bed weight as well as the minimum average ice basket weight will be increased. To calculate the new TS total ice weight a sublimation rate of 15% is assumed. The 15% sublimation rate is considered to be very conservative based upon the measured sublimation rates at Catawba being consistently lower than 5% per year as discussed above. Accounting for the increased sublimation rate, the new TS total ice bed weight for an 18 month surveillance frequency is 2,475,252 pounds. This is derived by adding to the safety analysis ice weight (2,[illegible]00 lbs.) a quantity of ice for an estimated sublimation rate of 1[illegible] [illegible]9,800 lbs.) and adding 1.1% more ice to account for weighing error (23,452 lbs.). Dividing this value by the total number of ice baskets (1944) yields the new TS minimum average ice basket weight of 1273 pounds per basket.

Previous surveillance results were compared to the proposed TS limits for row-group and total ice weight to demonstrate that Catawba would meet these new restrictions upon issuance of the requested license amendment. Total ice weight calculations from the previous three surveillances on Unit 1 and Unit 2 indicate that total ice weight exceeded the proposed limit of 2,475,252 pounds. In addition, the minimum average ice weight of the row-group sampling required by the TS surveillance exceeded the 1273 pounds per basket. Therefore, based upon the most recent TS surveillance data, Catawba will be in compliance with the proposed TS upon issuance by the NRC staff.

To demonstrate that the design basis ice weight will not be compromised, the Row 9 average ice basket ice weights from the last weighing surveillance were projected for an 18 month period. Row 9 baskets experience the greatest sublimation and are therefore bounding for the remainder of the Ice Condenser ice baskets. The Row 9 average ice weights were projected for an 18 month period using the actual Row 9 sublimation rates and also using an assumed sublimation rate of 15%. These projections are tabulated in Enclosure 1 for both Units. These projected weights were compared to the design basis weight of 1109 pounds per basket to ensure that sublimation over an 18 month interval would not challenge the design basis minimum Ice Condenser weight. The design basis weight for each basket is calculated by dividing the total amount of ice assumed in the LOCA safety analysis (2,132,000 lbs.) by the number of ice baskets (1944) and adding an additional amount of ice for measurement errors (1.1%). This analysis showed that the projected average ice weight of the Row 9 ice baskets remained above the design basis value over an 18 month period whether using actual sublimation rate data or an assumed 15% sublimation rate.

As discussed above, the <u>existing</u> total ice weight of both Unit 1 and 2 Ice Condensers is sufficient to account for sublimation that will occur over the remainder of an 18 month period. The next projected refueling outage date for Unit 1 is March 15, 1991 and October 22, 1991 for Unit 2. These projected outage dates correspond to an 11 month period for Unit 1 (300 EFPD core) and a 13 month period for Unit 2 (350 EFPD core). Therefore, the length of time between TS surveillances (outage-to-outage) for the existing quantity of ice in the Ice Condenser will be less than the 18 months specified in the proposed TS. This results in additional conservatism, ensuring the design basis ice weight will not be compromised based upon the TS surveillance being extended from 9 months to the next refueling outage on each Unit.

<u>Conclusion</u>

Operating experience at Catawba has shown that the Ice Condenser sublimation rates are much less than the 10% per 9 months as currently accounted for in the Ice Condenser Technical Specification 3/4.6.5.1. Using actual sublimation data and current ice basket weights, the average weight of each Bay's Row 9 ice baskets have been projected over an 18 month period. The Row 9 ice baskets experience the most sublimation and therefore bound the remaining baskets in the Ice Condenser. The projected average Row 9 ice basket weights all exceed the minimum average ice weight assumed in the safety analysis.

To ensure the minimum average ice weight for the duration of the new surveillance interval is not compromised, the TS required minimum total ice weight as well as the individual ice basket weight has been increased. Analysis of past ice weighing data indicates that the total ice weight and the minimum average ice weight per basket for the row-group analysis required by TSs has always exceeded the increased ice weight limits of the proposed Technical Specification.

It can be concluded that since the required weight of ice as assumed in the LOCA Peak Containment Pressure Transient analysis, which is the design basis for the Ice Condenser, will be present at the end of the 18 month cycle, the ice weighing interval can be extended to 18 months.

Ice Condenser Sublimation Data
Unit 1

Bay #	Average Sublimation Rate, Row 9 (lbs/yr)[1]	Average Sublimation Rate, Row 9 (%/yr)	Average Row 9 Weight (lbs)[2]	Projected 18 Month Weight Using Measured Sublimation (lbs)[3]	Projected 18 Month Weight Using 15% Sublimation (lbs)[3]
1	144	9.89	1456	1240	1238
2	73	5.11	1430	1321	1216
3	65	4.39	1480	1383	1258
4	61	4.22	1447	1355	1230
5	98	6.58	1489	1341	1266
6	60	3.89	1542	1452	1311
7	114	7.31	1560	1389	1326
8	94	6.21	1515	1374	1288
9	107	7.10	1508	1347	1282
10	67	4.41	1521	1421	1293
11	53	3.66	1449	1370	1232
12	20	1.35	1487	1457	1264
13	51	3.40	1499	1423	1274
14	41	2.67	1538	1477	1255
15	75	4.79	1567	1455	1332
16	30	2.01	1492	1447	1268
17	25	1.62	1541	1504	1310
18	46	2.98	1542	1473	1311
19	71	4.75	1495	1389	1271
20	88	5.63	1562	1474	1328
21	44	2.79	1577	1511	1340
22	47	3.06	1538	1468	1307
23	41	2.61	1573	1512	1337
24	140	9.42	1486	1276	1263

Total Average Sublimation Rate for Row 9 Baskets = 4.58 %/yr

Notes:
1. The sublimation rates are calculated on an annual basis (versus a 9 month rate) because the majority of the data was recorded during refueling outages that fell on a 12 month cycle.
2. Actual data from last TS ice weighing surveillance.
3. Projected minimum average ice weights all exceed design basis limit of 1109 pounds.

Ice Condenser Sublimation Data
Unit 2

Bay #	Average Sublimation Rate, Row 9 (lbs/yr)[1]	Average Sublimation Rate, Row 9 (%/yr)	Average Row 9 Weight (lbs)[2]	Projected 18 Month Weight Using Measured Sublimation (lbs)[3]	Projected 18 Month Weight Using 15% Sublimation (lbs)[3]
1	78	5.21	1496	1379	1272
2	62	4.35	1425	1332	1211
3	29	2.04	1422	1379	1209
4	110	7.43	1480	1315	1258
5	103	7.15	1440	1286	1224
6	93	6.20	1499	1406	1274
7	86	5.63	1527	1398	1298
8	82	5.53	1482	1360	1260
9	47	3.17	1482	1410	1260
10	35	2.49	1408	1356	1197
11	26	1.83	1420	1381	1207
12	32	2.21	1448	1400	1231
13	11	0.74	1480	1464	1258
14	28	1.91	1468	1426	1248
15	34	2.41	1414	1363	1202
16	71	4.87	1457	1351	1238
17	62	4.21	1473	1380	1252
18	74	5.02	1473	1362	1252
19	64	4.24	1510	1414	1284
20	129	8.39	1537	1344	1306
21	185	12.10	1531	1254	1301
22	18	1.22	1477	1450	1255
23	33	2.30	1432	1383	1217
24	27	1.82	1487	1487	1264

Total Average Sublimation Rate for Row 9 Baskets = 4.27 %/yr

Notes:

1. The sublimation rates are calculated on an annual basis (versus a 9 month rate) because the majority of the data was recorded during refueling outages that fell on a 12 month cycle.

2. Actual data from last TS ice weighing surveillance.

3. Projected minimum average ice weights all exceed design basis limit of 1109 pounds.

ATTACHMENT 3

Determiration of No Significant Hazards Considerations

Duke Power has evaluated the proposed TS change and has determined that it does not represent a significant hazards consideration based upon the criteria established in 10 CFR 50.92(c). Operation of Catawba Nuclear Station in accordance with the proposed amendment will not:

(1) Involve a significant increase in the probability or consequences of an accident previously evaluated.

Duke Power proposes to modify the Catawba Nuclear Station Unit 1 and Unit 2 TSs to revise Surveillance Requirement 4.6.5.1.b. to allow extension of the 9 month ice weighing interval to 18 months. Duke is requesting an extension to allow the ice weighing coincident with the refueling outages. The total ice bed weight and the minimum average ice basket weights are being increased to account for a 15% sublimation rate over the 18 month interval.

The Ice Condenser is provided to absorb the thermal energy release following a LOCA or steam line break inside Containment and thereby limiting the peak Containment pressure. The current design analysis is based upon a minimum average ice weight of 1109 lbs. per basket. Calculations using past Ice Condenser sublimation data indicate that the total ice bed weight will not fall below that value assumed in the safety analysis.

(2) Create the possibility of a new or different kind of accident from any previously analyzed.

Duke Power's request for an 18 month ice weighing interval will not result in a new or different kind of accident from that previously analyzed in Catawba's Final Safety Analysis Report. Catawba's Ice Condenser serves to limit the peak pressure inside Containment following a LOCA. Duke Power has evaluated past Ice Condenser sublimation data and has determined that a 15% allowance for sublimation is conservative for an 18 month interval. The proposed TS ice weights derived from the safety analysis weight plus additional allowances of 15% for sublimation and 1.1% for weighing errors will ensure that the ice bed will not decrease below that design basis weight. Therefore, the peak Containment pressure assumed in the safety analysis is still valid.

The structural stability of the Ice Condenser will not be affected by the increased ice weights in the proposed TS. Current ice loading practices result in newly loaded ice baskets well in excess of the TS limits. The existing structural design of the Ice Condenser has sufficient margin to conservatively bound the various loading combinations resulting from maximum ice loading and accident induced loads.

(3) Involve a significant reduction in a margin of safety.

The Ice Condenser is designed to limit the Containment pressure below the design pressure for all reactor coolant pipe break sizes up to and including a double-ended severance. Because the minimum required ice weight assumed in the safety analysis is not being altered, the margin of safety as described in the Peak Containment Pressure Transient is not impacted.

The Ice Condenser also serves as a Containment air purification and cleanup system by absorbing molecular iodine from the containment atmosphere following a LOCA. The required boron concentration (at least 1800 ppm) and pH (9.0 - 9.5) of the stored ice is not affected by this TS change request. Therefore, the air purification aspects of the Ice Condenser remain unchanged by this submittal and the margin of safety is not adversely impacted.

Environmental Impact

The proposed Technical Specification change has been reviewed against the criteria of 10 CFR 51.22 for environmental considerations. As shown above, the proposed change does not involve a significant hazards consideration, nor increase individual or cumulative occupational radiation exposures. Based on this, the proposed TS change meets the criteria given in 10 CFR 51.22(c)(9) for a categorical exclusion from the requirement for an environmental impact statement.